

DEVELOPING NEW TYPE OF DISK PLATE FOR MEAT CHOPPER AND ITS EFFECT TO WATER-BINDING CAPACITY AND YIELD STRESS OF MINCED MEAT

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ABSTRACT

This paper describes the construction of meat chopper with new type of perforated disk plate with variable sized holes. Cutting mechanism of meat chopper consists of knives, disk plate, rings and protracted screw-nut. Two set of cutting mechanism is used in this study: first (control) with disk plate with equal holes and the second (experimental) – disk plate with variable sized holes. Meat samples (beef, horse meat, poultry and pork) transported to the cutting mechanism by screw. Grinding process is carried out by cutting meat with four blade knife and squeezing it through disk plate with variable-sized holes. Water-binding capacity of minced meat grinded through second set of cutting mechanism showed higher values than control samples, as well as yield stress of minced meat. The obtained experimental data confirm that the process of grinding of meat can be improved by developing a cutting mechanism with new type of perforated disk plate with variable sized holes.

KEYWORDS: Meat Chopper, Disk Plate, Cutting Mechanism, Yield Stress & Knives

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INTRODUCTION

In modern industry, among all types of mechanical processing, grinding of food raw materials occupies a significant place and is one of the most important technological processes. For medium and fine grinding, mainly choppers are used, which are intended for the preliminary grinding of raw meat in the production of sausages or the final grinding of fat-containing raw materials, technical products, etc. They are characterized by high performance, ease of execution of the transporting and cutting mechanisms, convenience of maintenance and exploitation, reliability in work [1].

Currently, equipment for meat processing is produced at many plants in Russia, Kazakhstan and Belarus, including the enterprises of the former defense complex. However, the equipment of the countries of the Eurasian Union does not always ensure the possibility of producing finished products of the necessary range and quality. Therefore, there are currently a lot of offers of foreign firms on the Kazakhstan market that could satisfy the needs of food producers in expanding their product range [2].

A continual increase in production of meat products in the Republic of Kazakhstan necessitates the development of rational regimes for all production processes. Among them, the grinding process occupies the main place in the structure of the total production of sausages and meat semi-finished products [3, 4].

“If you want to be able to benefit from the **best meat mincer uk**, then there are a few things that you are going to need to know. First of all, it is important to understand how they work. There are two main types of grinder; the electric and the manual. Here is a brief explanation of how each one works.

The **electric meat mincer** is probably the most common type that you are going to come across these days. They work quite simply. Usually, you will have three blade types; fine, medium and coarse. Each blade type has its own uses.

Typically with an electric grinder you will be able to choose from various speed settings along with settings for specific things like Kibbe and sausages. The process is simple; you choose your speed and you setting, you feed the chunks of meat into the machine and push it down with the food pusher. Through the other end you will see your minced meat as it goes through. It really is as simple as that.

The **manual meat mincer** has been around for decades and was the original method of mincing meat. Usually, the process is very similar to what you would expect from an electric mincer. The only difference is that you will have a hand crank to turn which will rotate the blades which will mince the meat. Although some people still use manual mincers, electric mincers are more popular.

If you have yet to use a meat grinder, then you will probably find yourself wondering about the ways in which you can benefit from using one. With this in mind, here are a couple of examples.

Create your Own Recipes – Burgers and sausages are popular the world over, but especially in the UK. One of the good things about using a meat grinder at home is that you are able to create your own unique recipes for them both. You can add herbs and spices and even experiment with different meat, the opportunities are endless.

Know Exactly What Is In your Food – These days, a lot of people find themselves worrying about what preservatives and additives are going into their food, including fresh meat. By grinding your own meat you can rest assured that you know exactly what is going into it so you no longer have to worry about any potentially harmful ingredients.

Fresher Meat – When you buy your minced meat from the supermarket or the butchers, it will be fresh to an extent. However, you don't know how long it remained in its original form before it was minced. When you mince your own meat, you can guarantee freshness which will certainly improve the taste and texture.

Finally, it is a good idea to look for a meat mincer that has a variety of accessories that come with it for different things like sausages and kibbe. Most high-quality meat grinders will have a number of different accessories with them for different things, so take a look at them and see which can offer you the best value for money.

By taking your time looking at these different things, you are far more likely to be able to benefit from a **home meat**".

A grinding wheel is an expendable wheel used for various grinding and abrasive machining operations. It is generally made from a matrix of coarse abrasive particles pressed and bonded together to form a solid, circular shape, various profiles and cross sections are available depending on the intended usage for the wheel. Grinding wheels may also be made from a solid steel or aluminium disc with particles bonded to the surface.

Currently, small meat-processing and sausage making enterprises and public catering enterprises use meat choppers and grinders of various designs. The minced meat after grinding process some of existing grinding equipment is not satisfied the good quality, with large losses of meat. Moreover these grinders consume a huge amount of electricity. Among foreign manufacturers of meat grinding equipment, the following companies should be noted: «Kremer und Grebe», «Alexander-Werke AG», «MEISSINER GmbH + Co. KG», «Seydelmann KG» (Germany), «Valer», «Kilia», «Laska» (Austria), «Wolfking Danmark» (Denmark), «Palmia» (Sweden) and others. Machines of these foreign companies have a high cost and are not «affordable» for domestic producers [5, 6].

Based on the above analysis, one of the possible ways to solve the problems facing these enterprises is the development and creation of technological grinding machines with a cutting mechanism that provides better grinding of raw materials. Moreover, the study and optimization of the process carried out in these machines is an important scientific task.

Sometimes called cutting plates, grinding plates are made of stainless steel or carbon, mostly round in shape with lots of holes punctured in them. During grinding, meat is pushed through the holes, and as the blades spin, the holes cut the meat at an incredible speed.

“Grinding plates are usually of varied sizes – only ensure that the size you pick matches with the base of your grinder where it will be mounted. Sometimes, it’s nice to purchase an extra grinding plate. Doing so gives you more variety from which you can select from when preparing meat-based snacks. Proper maintenance of meat grinders requires frequent replacement of the grinding plate. As a rule, replace cutting knife when installing the replacement part for the plate”.

These machines include the:

“Belt grinder, which is usually used as a machining method to process metals and other materials, with the aid of coated abrasives. Analogous to a belt sander (which itself is often used for wood but sometimes metal). Belt grinding is a versatile process suitable for all kind of applications, including finishing, deburring, and stock removal.”

“Bench grinder, which usually has two wheels of different grain sizes for roughing and finishing operations and is secured to a workbench or floor stand. Its uses include shaping tool bits or various tools that need to be made or repaired. Bench grinders are manually operated”.

“Cylindrical grinder, which includes both the types that use centers and the center less types. A cylindrical grinder may have multiple grinding wheels. The work piece is rotated and fed past the wheel(s) to form a cylinder. It is used to make precision rods, tubes, bearing races, bushings, and many other parts”.

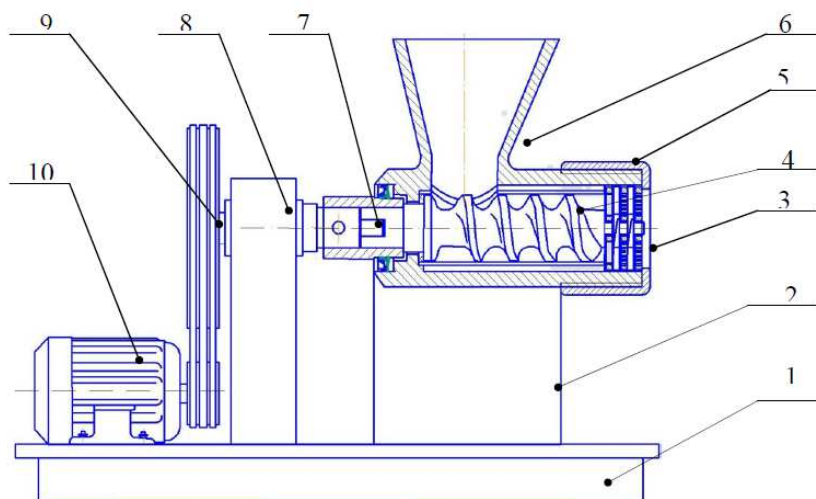
“Surface grinder, which has a head that is lowered to a work piece, which is moved back and forth under the grinding wheel on a table that typically has a controllable permanent magnet (magnetic chuck) for use with magnetic stock (especially ferrous stock) but can have a vacuum chuck or other fixture means. The most common surface grinders have a grinding wheel rotating on a horizontal axis cutting around the circumference of the grinding wheel. Rotary surface grinders, commonly known as **Blanchard** style grinders, have a grinding head which rotates the grinding wheel on a vertical axis cutting on the end face of the grinding wheel, while a table rotates the work piece in the opposite direction underneath. This type of machine removes large amounts of material and grinds flat surfaces with noted spiral grind marks. It can also be used to make and sharpen metal stamping die sets, flat shear blades, fixture bases or any flat and parallel surfaces. Surface grinders can be manually operated or have CNC controls”.

“Tool and cutter grinder, which usually can perform the minor function of the drill bit grinder, or other specialist tool room grinding operations”.

“Jig grinder, which as the name implies, has a variety of uses when finishing jigs, dies, and fixtures. Its primary function is in the realm of grinding holes for drill bushings and grinding pins. It can also be used for complex surface grinding to finish work started on a mill”.

MATERIALS AND METHODS

For grinding meat and bone raw materials, we have developed and manufactured an experimental chopper (Figure 1). The chopper is manufactured according to the developed design documentation in Semey branch of the Kazakh Research Institute of Processing and Food Industry LLP. It is intended for medium and fine grinding of meat and bone raw materials, hard confiscated products, a mixture of hard and soft confiscated foods, as well as melted blocks of frozen meat.



**1: Frame; 2: Case; 3: Cutting Mechanism; 4: Screw;
5: Protracted Screw-Nut; 6: Bunker; 7: Clutch; 8: Gearbox;
9: Belting; 10: Electric Motor**

Figure 1: Experimental Chopper.

It consists of a frame, auger, gearbox, electric motor, wedge belt transmission, casing, blocking, bunker. The main executive part of the chopper is a grinding device, which is a set of matrices and grinders, alternating in a specific order: a matrix with large triangular holes, a grinder, a matrix with small triangular holes, a matrix with round holes. Matrices are installed in the nozzle and fixed with stoppers. The grinders put on the front end of the auger. Pieces of raw materials with sizes up to 40 mm are loaded into the bunker, they are picked up by the auger and moved to the grinding device. The grinding of raw materials occurs with fixed matrices and rotating grinders. The auger is driven by an electric motor through a wedge belt transmission and gearbox [7].

For moving the product in the working chamber, feed it to the knives and push through the knife grids, a rotating auger with a uniform pitch of turns serves. The peculiarity of the auger operation is the preliminary grinding of meat and bone raw materials and their creation of pressure sufficient to move the product through the cutting mechanism without squeezing the liquid phase contained in it.

The augers are divided into cylindrical and conical; with constant or variable pitch; by the number of turns; by the number of auger entry; on the profile of the turn; with or without trimming.

The cutting tool of the chopper consists of fixed grids and rotating knives. Fixed knife grids are made in the form of discs with round holes and are paired cutting parts with rotating knives.

The chopper is completed with four grids with hole diameters of 5, 8, 16, 25 mm, three sector and one cutting grids (figure 2), as well as three cross-shaped and two two-blade knives (figure 3).

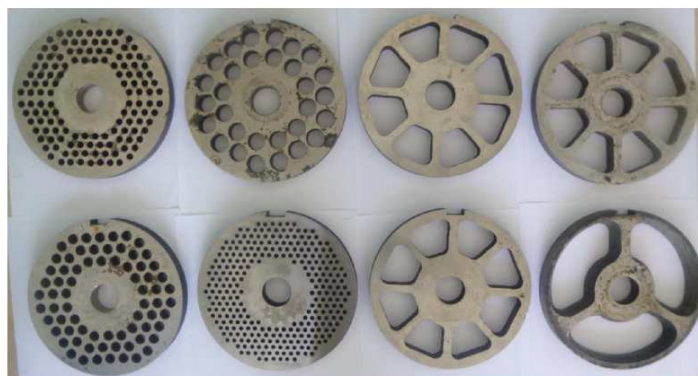


Figure 2: Disk Plates (Grids) of Meat Chopper.



Figure 3: Disk Plate (Grid) with Variable-Sized Holes.

We developed a new type of disk plate (grid) with variable-sized holes (Figure 3). Given construction has variable-sized holes. The size of holes increased from periphery to the central zone of the plate.

Knives and grids put on a steel finger parallel to their faces, screwed into the front end of the screw. The central hole of the knife has the same shape as the outer contour of the auger finger, thanks to which the rotation of the latter is transmitted to the knife. The grids are put on the auger finger freely and are kept from turning by a spline rigidly fixed in the case of the chopper. The tight fit of the working planes of knives and grids is provided by a push nut.

Cross-shaped knives of traditional construction are four-blade with axial location of cutting edges, the front part of which is a rectangular plane, perpendicular to the cutting edge.

The developed design of the chopper top was tested under production conditions at Semipalatinsk Meat-Packing Plant and “Tyumenbayev Sausage Company” (Semey city, Kazakhstan), which showed that the most common cross-shaped knives showed themselves not in the best way, since the auger creates a different pressure on the crushed raw materials in the zone of action of each of the four blades interacting with the grid. The presence of large technological losses confirms the hypothesis that three blades of a knife located far from the end surface of the auger allow raw material to bend around the blades and at the same time to be a local resistance contributing to an increase in technological losses [8].



Figure 4: Knives of Chopper.

In accordance with figure 4, we proposed two-bladed knives, which have two blades, the cutting edges of which cut and push the ground meat. When improving the design of the knives of the chopper, a significant place is given to the study of the technological parameters of the processes occurring in the cutting mechanism of the chopper with medium and fine grinding of meat and bone raw materials and its quality. When studying the technological parameters of the processes occurring in the cutting mechanism with medium and fine grinding, the issue of technological losses was reviewed.

Thus, in the course of the research, the design documentation, manufacturing technology, prototype of the chopper and its working parts were developed. Tests of the developed chopper were held in production conditions. As a result of the tests, the perfection of the design of the experimental design of the chopper was established, which will make it possible to introduce the developed manufacturing technology into mass production. “Both electric and manually operated grinders are ideal for processing different types of food. Though generally known as “meat” grinders, these machines are ideal for processing vegetables, cheese, and nuts” grinding nuts If you are in need of ideas, feel free to try out any of these:

Fruit Sorbet: “Prepare a mouth-watering fruit sorbet by mixing bananas with mangoes and strawberries, and then grinding using a meat grinder. Next, store in the freezer to cool”.

Nut butter: “Preparing this is quite simple. Simply mix almonds with peanuts, place the mixture in a meat grinder and then grind”.

Baby foods: “Meat grinders can be used for preparing baby food peas, vegetables, fruit and cooked meat”.

Cheese crumbles: “Meat grinders are ideal for preparing parmesan crumble and every other form of hard cheese crumble”.

Taking all above mentioned applications for meat choppers, it is very important to consider mechanical property of plates during the use of this apparatus.

Surface Grinding

“Surface grinding uses a rotating abrasive wheel to remove material, creating a flat surface. The tolerances that are normally achieved with grinding are $\pm 2 \times 10^{-4}$ inches (5.1 μm) for grinding a flat material and $\pm 3 \times 10^{-4}$ inches (7.6 μm) for a parallel surface.”[1]

The surface grinder is composed of an abrasive wheel, a work holding device known as a chuck, either electromagnetic or vacuum, and a reciprocating table.

“Grinding is commonly used on cast iron and various types of steel. These materials lend themselves to grinding because they can be held by the magnetic chuck commonly used on grinding machines and do not melt into the wheel, clogging it and preventing it from cutting. Materials that are less commonly ground are aluminum, stainless steel, brass, and plastics. These all tend to clog the cutting wheel more than steel and cast iron, but with special techniques it is possible to grind them”.

Cylindrical Grinding

Cylindrical grinding (also called center-type grinding) is used to grind the cylindrical surfaces and shoulders of the work piece. The work piece is mounted on centers and rotated by a device known as a lathe dog or center driver. The abrasive wheel and the work piece are rotated by separate motors and at different speeds. The table can be adjusted to produce tapers. The wheel head can be swiveled. The five types of cylindrical grinding are: outside diameter (OD) grinding, inside diameter (ID) grinding, plunge grinding, creep feed grinding, and centerless grinding.

A cylindrical grinder has a grinding (abrasive) wheel, two centers that hold the work piece, and a chuck, grinding dog, or other mechanism to drive the work. Most cylindrical grinding machines include a swivel to allow the forming of tapered pieces. The wheel and work piece move parallel to one another in both the radial and longitudinal directions. The abrasive wheel can have many shapes. Standard disk-shaped wheels can be used to create a tapered or straight workpiece geometry, while formed wheels are used to create a shaped work piece. The process using a formed wheel creates less vibration than using a regular disk-shaped wheel.

“Tolerances for cylindrical grinding are held within ± 0.0005 inches (13 μm) for diameter and ± 0.0001 inches (2.5 μm) for roundness. Precision work can reach tolerances as high as ± 0.00005 inches (1.3 μm) for diameter and ± 0.00001 inches (0.25 μm) for roundness. Surface finishes can range from 2 microinches (51 nm) to 125 microinches (3.2 μm), with typical finishes ranging from 8 to 32 microinches (0.20 to 0.81 μm)”

Creep-Feed Grinding

(CFG) was invented in Germany in the late 1950s by Edmund and Gerhard Lang. Unlike normal grinding, which is used primarily to finish surfaces, CFG is used for high rates of material removal, competing with milling and turning as a manufacturing process choice. Depths of cut of up to 6 mm (0.25 inches) are used along with low work piece speed. Surfaces with a softer-grade resin bond are used to keep work piece temperature low and an improved surface finish up to 1.6 μm Rmax.

With CFG it takes 117 s to remove 1 in³ (16 cm³) of material, whereas precision grinding would take more than 200 s to do the same. CFG has the disadvantage of a wheel that is constantly degrading, requires high spindle power (51 hp or 38 kW), and is limited in the length of part it can machine.[4]

To address the problem of wheel sharpness, continuous-dress creep-feed grinding (CDCF) was developed in 1970s. It dresses the wheel constantly during machining, keeping it in a state of specified sharpness. It takes only 17 s to remove 1 in³ (16 cm³) of material, a huge gain in productivity. 38 hp (28 kW) spindle power is required, with a low to conventional spindle speeds. The limit on part length was erased.

“**High-Efficiency Deep Grinding (HEDG)** uses plated super abrasive wheels, which never need dressing and last longer than other wheels. This reduces capital equipment investment costs. HEDG can be used on long part lengths and removes material at a rate of 1 in3 (16 cm3) in 83 s. It requires high spindle power and high spindle speeds”.

“**Peel Grinding**, patented under the name of Quick point in 1985 by Erwin Junker Maschinen fabrik, GmbH in Nordrach, Germany, uses a thin super abrasive grinding disk oriented almost parallel to a cylindrical work piece operates somewhat like a lathe turning tool”.

RESULTS AND DISCUSSIONS

Effect of Different Set of Cutting Mechanism of Meat Chopper to Water-Binding Capacity of Minced Meat

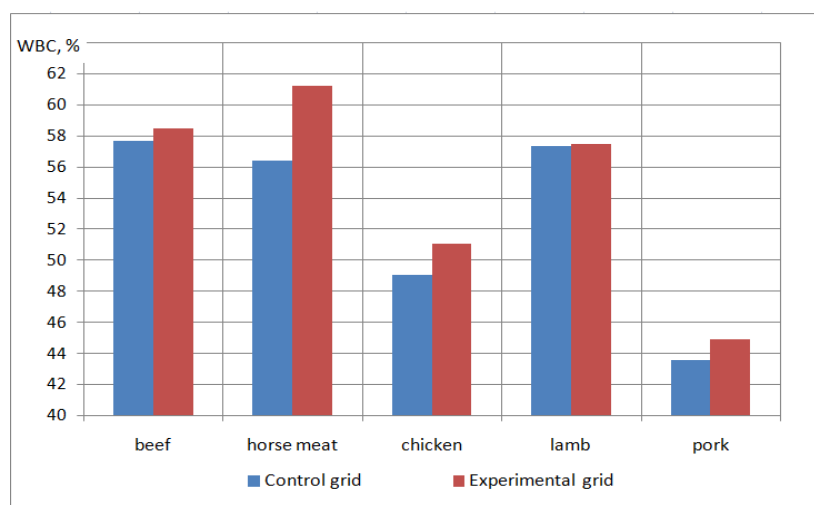
When improving the design of the cutting mechanism of the chopper, a significant place is given to the study of the technological parameters of the process of grinding meat raw materials and its quality. The quality was established on the basis of a study of the moisture-binding capacity of the crushed raw materials.

Comprehensive studies to determine the rational modes of grinding meat raw materials were carried out in laboratory conditions at the facility (installation), the design and operation of which are described above. We studied the dependence of the moisture-binding capacity and the ultimate shear stress of ground meat on the design of the cutting mechanism.

The object for the experiments was chosen minced meat of various types of raw meat: beef, lamb, horse meat, chicken, pork. The change of moisture-binding capacity and yield stress of minced meat was determined depending on the design of the cutting mechanism. Two sets of cutting mechanism were used:

- Set (traditional) - a receiving grid, a cross-shaped knife, a grid with a hole diameter of 8 mm;
- Set (designed) - a receiving grid, a cross-shaped knife, a grid with variable hole diameters.

The results of the experimental determination of the moisture-binding capacity of minced meat in the work were investigated by the method of pressing and presented in the form of dependencies of the moisture-binding capacity of ground meat on the type of raw meat and design of the cutting mechanism (Figure 5).



1: Minced Beef, 2: Minced Horse Meat, 3: Minced Chicken Meat,
4: Minced Lamb, 5: Minced Pork

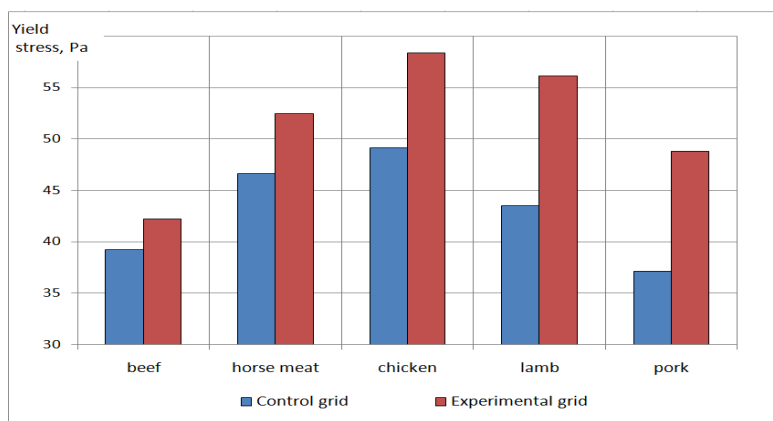
Figure 5: Change in Water-Binding Capacity with the Construction of Cutting Tool of Meat Chopper.

Experiments made it possible to establish that 2 sets of the cutting mechanism are characterized by large values of the water-binding capacity of minced meat, which confirms the efficiency of using the developed grille with a variable hole diameter when grinding various types of raw meat.

Effect of Different Set of Cutting Mechanism of Meat Chopper to Yield Stress of Minced Meat

The most important factor affecting the values of the rheological parameters of minced meat is the ultimate shear stress [9, 10]. The ultimate shear stress of ground meat has an effect on the processing conditions and the quality of finished products. The determination of the ultimate shear stress was carried out on the stand according to the method described in Section 2.

With the help of an experimental device, the values of the ultimate shear stress of various types of minced meat are determined. When conducting research, 2 sets of cutting mechanism were used: traditional and developed. Conducted more than 10 experiments.



1: Minced Beef, 2: Minced Horse Meat, 3: Minced Chicken Meat, 4: Minced Lamb, 5: Minced Pork

Figure 6: Change in Yield Stress with the Construction of Cutting Tool of Meat Chopper.

In accordance with Figure 6, based on the results of the experiments, a graph of the dependence of the ultimate shear stress of various types of minced meat on the design of the cutting mechanism was constructed.

When grinding by the traditional cutting mechanism, the values of the yield stress did not reach their extreme values, the chicken beef had the greatest value of the yield stress. The minced meat obtained by the developed cutting mechanism reached extreme values of the yield stress, also had the greatest value for chicken minced meat.

When the type of minced meat was changed, the values of the yield stress for lamb and pork minced meat decreased exponentially. The angular speed of the auger does not have a significant effect on the change in the value of the yield stress of the minced meat, therefore the frequency of rotation of the screw was constant. Consequently, when using the developed cutting mechanism, which incorporates a grid with variable hole diameters, the yield stress of various types of ground meat has the greatest rational values compared to the traditional cutting mechanism.

Of course, the simplicity of using a manual meat grinder comes at a cost; often using one can **require quite a bit of effort**, particularly if you are planning on grinding a large quantity of meat. An electric version can do this effortlessly

and would better suit anyone that wants to grind a lot of meat in one go.

“The guaranteed power that comes with an electric meat grinder **can quickly deal** with any larger or tougher chunks of meat, in comparison to a manual. If your meat still contains bones an electric grinder will power through this, whereas manually, additional effort would be required to continue grinding at the same consistency.

All electric models will have a gear system inside, which of course, on occasion can go wrong. If you stick to the manufacturer’s recommendations, it should all run smoothly for a long time to come, but running your grinder over capacity can cause irreparable damage that wouldn’t be associated with a manual meat grinder.

A meat grinder of large size can comfortably handle large volumes of meat, and at a faster rate. The rate is measured in pounds/hour. If you prefer manually operated meat grinder, do bear in mind that grinders of larger sizes require greater efforts when turning the crank. To make things easy, most large sized meat grinders have a long crank handle which lessens your job when grinding meat with them. But if you have a preference for electric grinders, it is necessary you note the power of their motors because large sized grinders have engines with higher power rating. This is because they expend more energy when grinding the large volume of meat fed into So as a rule; the bigger the grinder (manual or electric), the higher the cost. Big sized grinders offer more speed. However, they require greater power.

The holes on the plates of grinders are of different size, with some being bigger while others smaller. Plates with small sized holes measuring between 1/8”, 3/16” and ¼” in diameter are ideal for making well-ground meat which can be used for preparing hamburgers, franks, and bologna. Grinding plates with big holes of size ½” makes it possible for the meat of large size to find their way through when grinding the meat. Also known as a coarse or medium plate, large sized grinding plates are ideal for making sausages. Most manufacturers include an extra plate in their grinders. However, you can conveniently buy more plates separately. The chart below shows all the hole sizes drilled on grinder plates. It also shows the type of sausage each hole can produce. Weight won’t make much difference if you will be doing lots of grinding. Only ensure you set out a spot on your countertop where your new grinder will seat. If you care much about good looks, then you have nothing to be worried about because most manufacturers take aesthetics into consideration when producing their grinders. You will sure have to lift your grinder as often as possible when the need to keep it off sight arises. Ensure you determine the weight of the grinder you intend buying before making purchases on line, some commercial models can be heavy. Models of higher weights often come with adjustable handles as they would help make moving the grinder easy.

The majority of meat grinders will come with a variety of accessories, depending on what you want to use it for this may effect which one you purchase. In fact, if you already own a blender such as the Kitchen Aid you can buy just the grinder attachment rather than a whole new unit.

Each grinder should come with at least two different plates that will dictate the size of mince that you produce. Other attachments can include various size stuffing tubes for sausage making, juicers, strainers and optional foot switches. A good example of a model with a large range of attachments would be the STX Turbo force II which comes with foot pedal control, six grinding plates, three cutting blades, kubbe and sausage stuffing tubes. These can all add to the overall use and enjoyment that you get from your meat grinder; if you plan on using it for something specific make sure it comes with the right attachment.

The majority of grinders should also come with a meat plunger, this is important, particularly if you plan to use

your grinder for sausage making. To avoid getting air into the sausage, the meat should be tightly packed and continually fed through the grinder. This is only realistically possible with a meat plunger; if it's sausages that you want, make sure that grinder comes with one.

If you already have a stand mixer, you can buy an attachment that will transform it into a meat grinder. An attachment like this is perfect for people who don't plan on grinding large quantities of meat at once. If you think you are going to be a casual user, then purchasing an attachment might be better than buying a whole grinding unit; it gives you all the functionality of a grinder at only a fraction of the price. It won't work for large quantities, but it's perfect for one person or a small family. It's also good for trying out how often would you use a meat grinder. Carbon knives and steel plates are most of the time cheaper than those made of stainless steel. However, they are less durable than stainless steel and quickly lose their sharpness. One other advantage stainless steel plates and knives have over that of carbon steel is that rust hardly affects them. An extra level of care is needed to prevent carbon steel plates from rusting. You have to keep them in dry places or get them dipped in light coating oil. If possible, go for stainless steel grinders because they require zero maintenance and pose no physical threat. Most modern models of maintenance meat grinders don't need maintenance and require very little lubrication. The dishwasher will be of no use if your meat grinder is made of cast iron. You will have to wash them manually with your hands to keep away rusting. Grinders made of cast iron must be kept in areas free of moisture to avoid rusting. Ensure you use a clean, dry piece of cloth to dry after washing. Better still, you can coat your grinder with cooking or mineral oil to guard against rusting. As for storage, it is recommended you break your grinder down, separating each component before then storing in a zip top bag. Surrounding the stored components with dry grains like rice absorbs every form of moisture, thus keeping your equipment dry at all times".

Originally Answered: What are different grinder plates hole sizes for?

"Grinder plates come with different sized holes to allow for larger or smaller sized chunks of meat to pass through. Grinder plates with smaller diameter holes, like 1/8", 3/16", or 1/4", make a fine ground meat for making franks, bologna, or hamburger. Plates with larger holes, say 1/2" and larger, allow larger pieces of meat to pass through. These larger plates, sometimes called medium or coarse grinding plates, are used for making various types of sausage. Most grinders come with one or two grinding plates, but more plates can be purchased separately".

The following chart shows some common grinder plate hole sizes and what kind of sausage and meat products they can be used to make.

The holes in the grinding plates are relatively sharp when new, but tend to dull over time as they are used and should be replaced periodically. We recommend replacing your plates and cutting knife at the same time

Form grinding is a specialized type of cylindrical grinding where the grinding wheel has the exact shape of the final product. The grinding wheel does not traverse the work piece.[5]

"Internal grinding is used to grind the internal diameter of the work piece. Tapered holes can be ground with the use of internal grinders that can swivel on the horizontal.

Center less grinding is when the work piece is supported by a blade instead of by centers or chucks. Two wheels are used. The larger one is used to grind the surface of the work piece and the smaller wheel is used to regulate the axial movement of the work piece. Types of center less grinding include through-feed grinding, in-feed/plunge grinding, and

internal center less grinding.

Pre-grinding when a new tool has been built and has been heat-treated, it is pre-ground before welding or hard facing commences. This usually involves grinding the OD slightly higher than the finish grind OD to ensure the correct finish size.

Electrochemical grinding is a type of grinding in which a positively charged work piece in a conductive fluid is eroded by a negatively charged grinding wheel. The pieces from the work piece are dissolved into the conductive fluid”.

CONCLUSIONS

The obtained experimental data confirm that the process of grinding meat raw materials can be improved by developing a cutting mechanism incorporating a grid with variable diameters of holes with their increase from the periphery to the center. A fundamentally new disk plate design has been developed and proposed, the novelty of which is confirmed by a patent for a utility model of the Republic of Kazakhstan No. 2484. Moreover, using the new type of disk plate with variable-sized holes can increase the working time of knives. “Mechanical properties will change due to stresses put on the part during finishing. High grinding temperatures may cause a thin marten sitic layer to form on the part, which will lead to reduced material strength from micro cracks.

Physical property changes include the possible loss of magnetic properties on ferromagnetic materials.

Chemical property changes include an increased susceptibility to corrosion because of high surface stress”.

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